

LAYER 7 USER GENERATES A MESSAGE
 LAYER 6 USER ADDRESSES MESSAGE &
 BUILDS THE INTERNET HEADER
 LAYER 5 SESSION NOT USED (DATA GRAM SERVICE)
 LAYER 4 TRANSPORT CONTROL

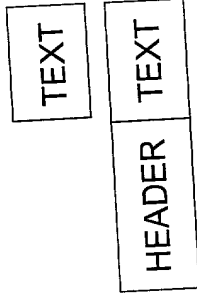
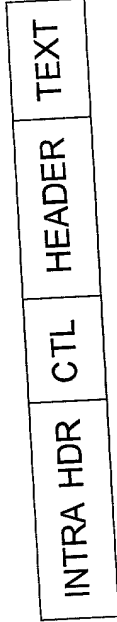


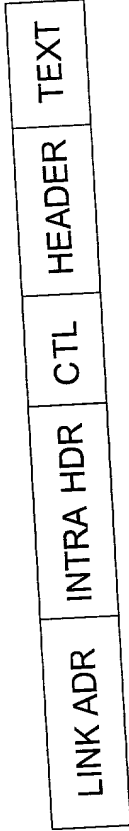
FIG.1

SEGMENTS MESSAGE INTO MULTIPLE FRAMES WHEN
 TEXT EXCEEDS A SINGLE FRAME SIZE, RECONSTRUCTS
 THE MESSAGE FROM RECEIVED FRAMES, PROVIDES AN
 END-TO-END WITH ITS PEER TRANSPORT LAYERS

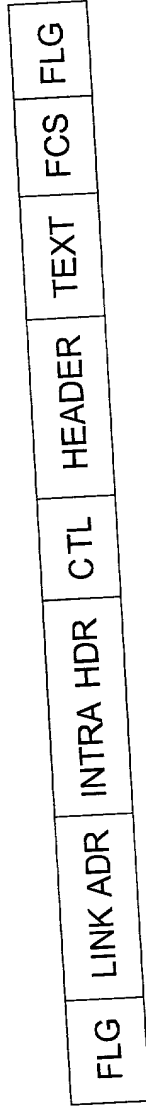
LAYER 3A ROUTES FRAME/MESSAGE
 TO INTRANET STATIONS OR
 SELECTS FDX CIRCUIT



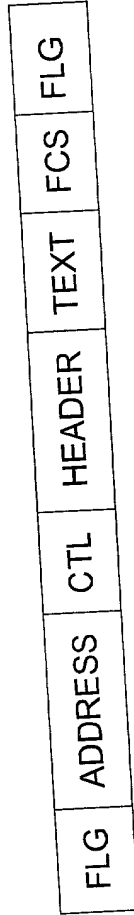
LAYER 3B ROUTES THE
 INTRANET ADDRESSES
 & BUILDS THE LINK
 ADDRESS LIST WITH RELAYS



LAYER 2 FRAME
 HDX
 BUILDS THE CONTROL FIELD,
 ADDS THE FCS



LAYER 2 FRAME
 FDX
 BUILDS THE CONTROL &
 ADDRESS FIELDS, ADDS THE FCS, &
 PRESENTS THE FRAME TO THE LINK



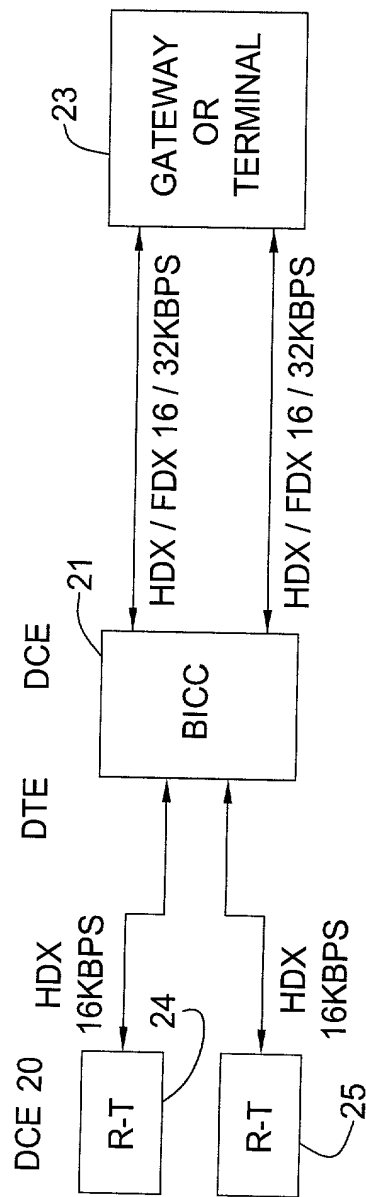


FIG. 2A

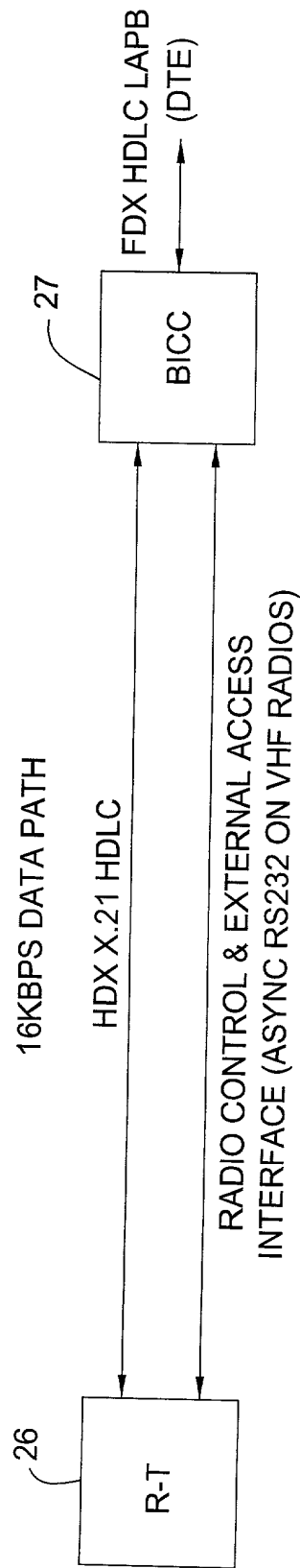


FIG. 2B

FIG.2C

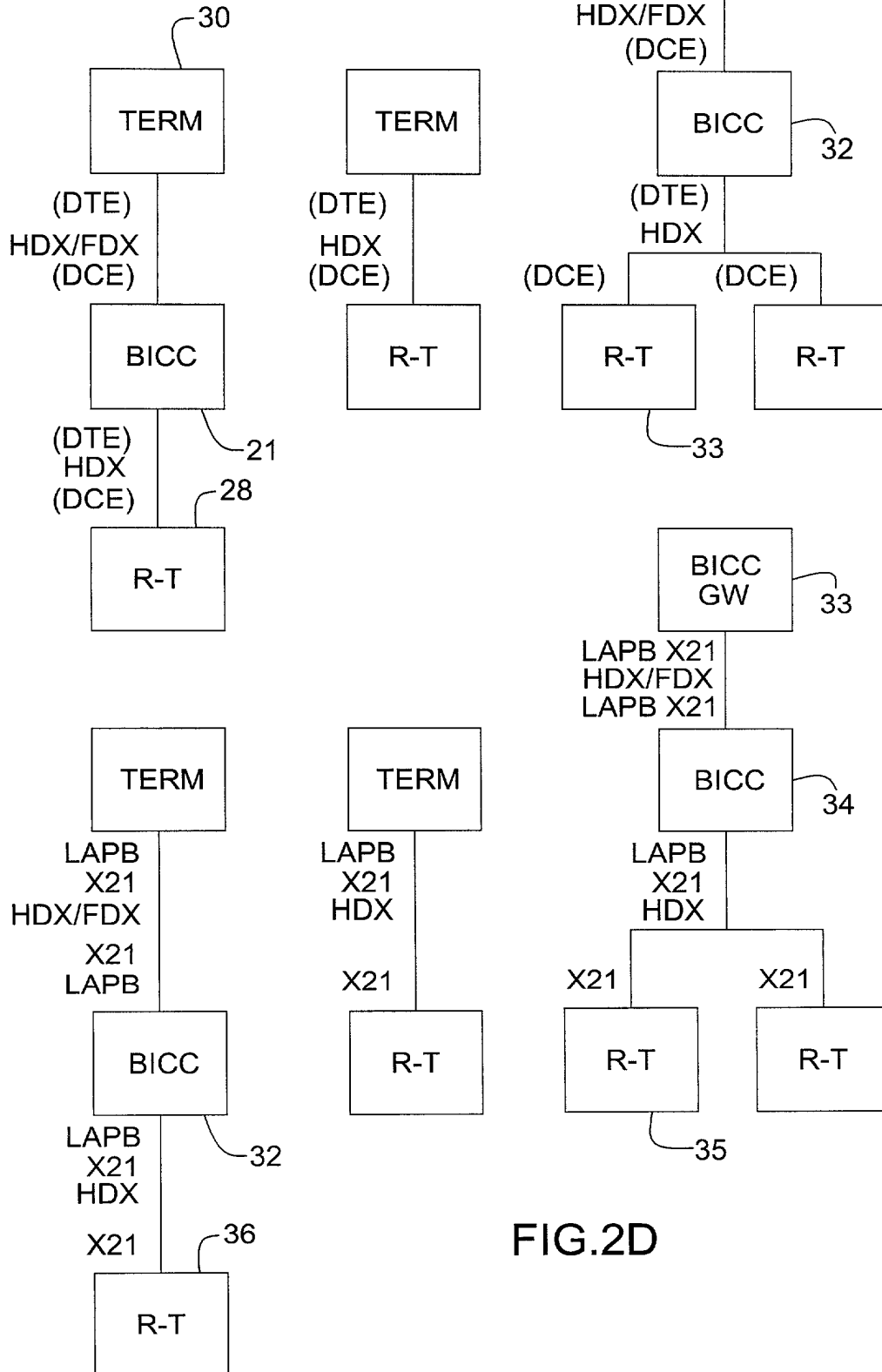


FIG.2D

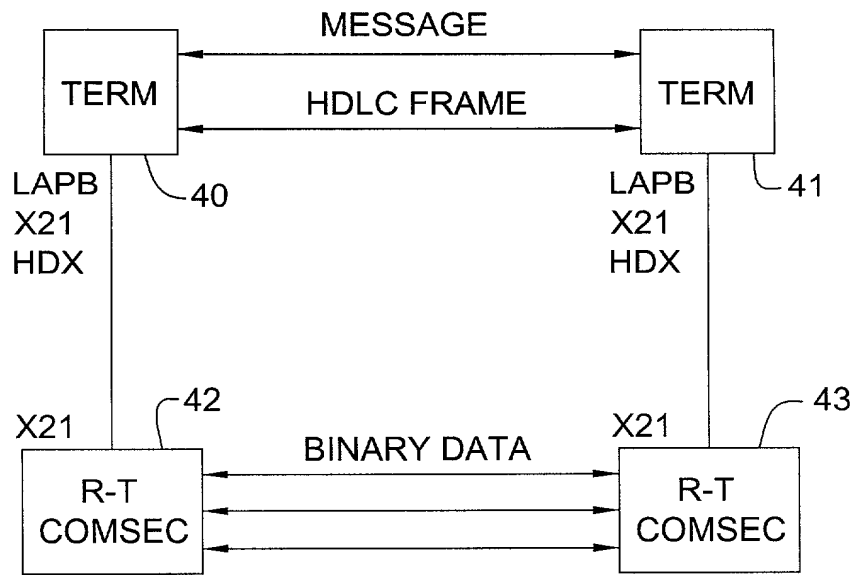


FIG.2E

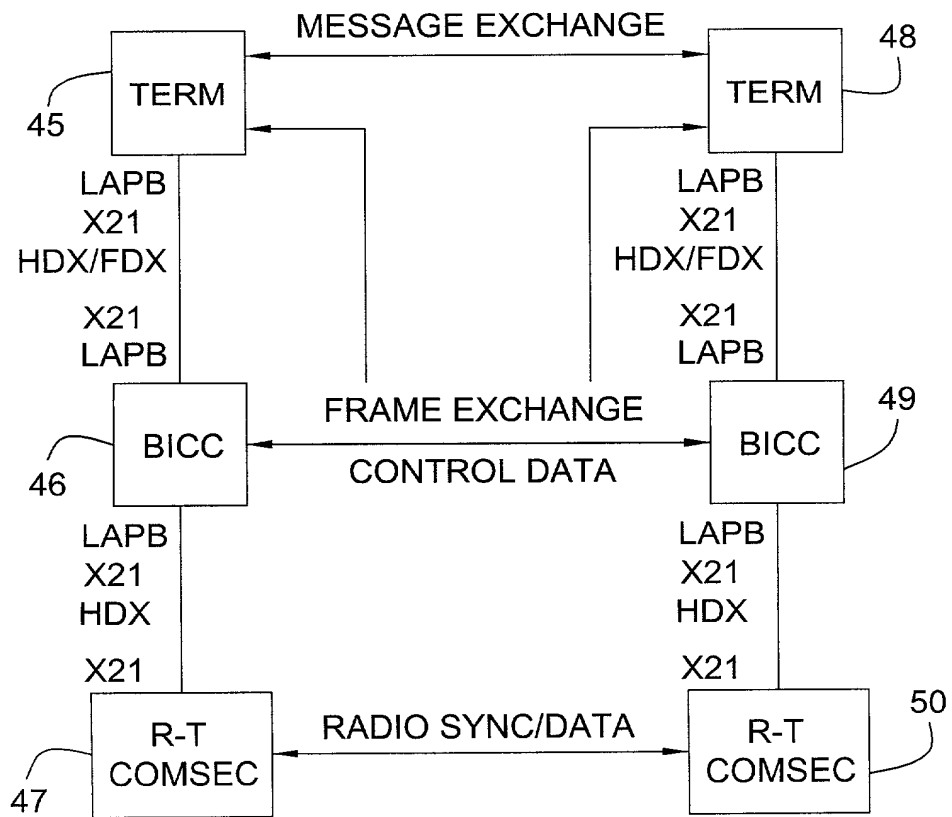


FIG.2F

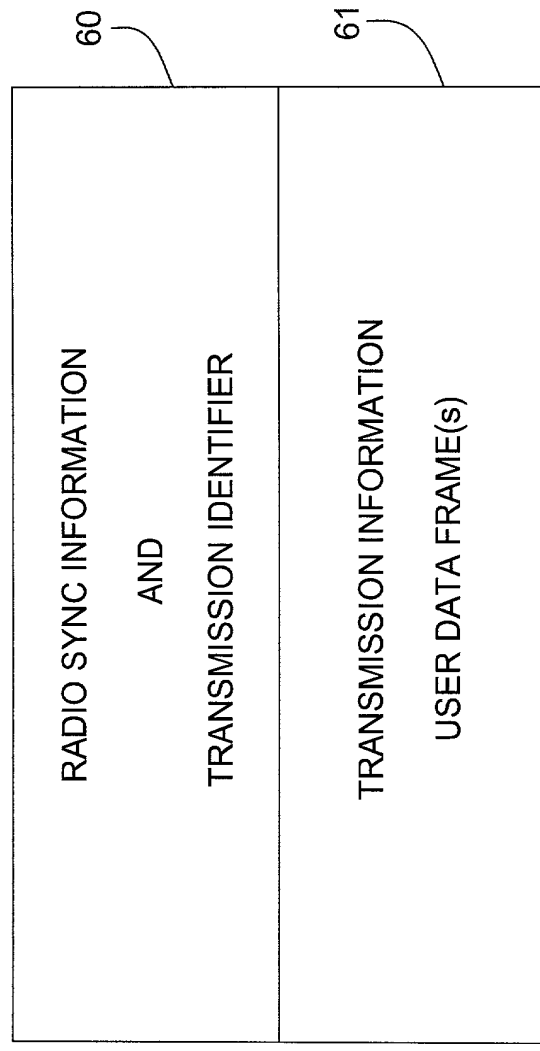
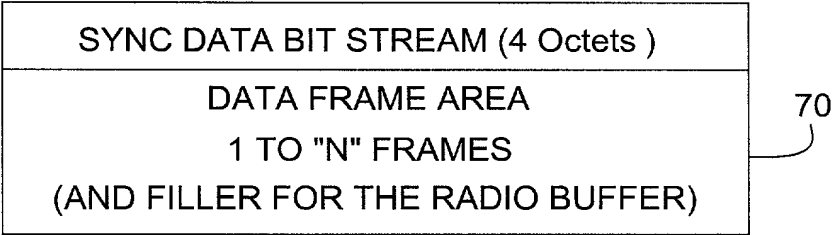
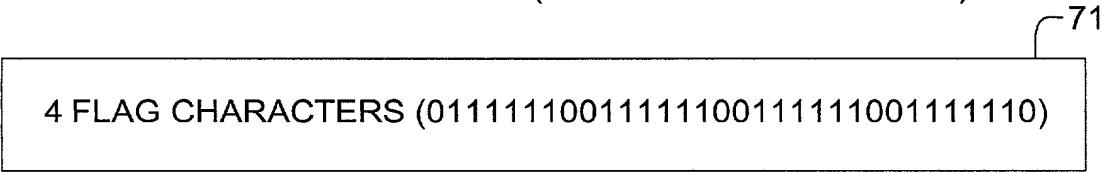


FIG.3

LAYER 1
DATA TRANSMISSION COMPONENTS



SYNC DATA BIT STREAM (AT LEAST 4 HDLC FLAGS)



DATA FRAME AREA

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BYTE SIZE	CONTENTS
1	OPENING FLAG FOR FRAME #1
N	DATA FRAME #1
1	CLOSING FLAG FOR FRAME #1
1	OPENING FLAG FOR FRAME # 2
N	DATA FRAME #2
1	CLOSING FLAG FOR FRAME #2
N	PADDING/FILLER FOR THE RADIO BUFFER

EACH DATA FRAME

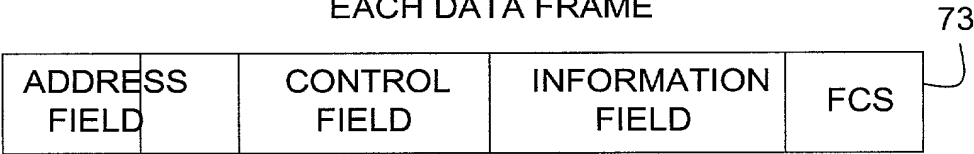


FIG.4

SYSTEM CLASSMARK PARAMETER	DEFAULT SETTING	PURPOSE
LAYER 2 FRAME SIZE	256 OCTETS	DEFINE THE SIZE OF THE MAXIMUM LAYER 2 FRAME SIZE
TRANSPORT TEXT SIZE	128 OCTETS	DEFINE THE MAXIMUM NUMBER OF OCTETS TRANSPORT MAY PUT IN A FRAME (MUST BE LESS THAN FRAME SIZE)
TRANSPORT WINDOW TIMER	10 SECONDS	THE AMOUNT TIME THAT TRANSPORT WILL WAIT FOR AN ACKNOWLEDGEMENT
TRANSPORT ACCUMULATION TIMER	8 SECONDS	THE AMOUNT OF TIME THE DESTINATION TRANSPORT WILL ACCUMULATE FRAME BEFORE SENDING AN ACKNOWLEDGEMENT
TRANSPORT MAXIMUM RE-TRANSMIT COUNT	2	THE MAXIMUM NUMBER OF TIME TRANSPORT WILL RE-TRANSMIT A FRAME THE MESSAGE WILL BE CANCELED IF EXCEEDED
TRANSPORT MAXIMUM FRAME COUNT	80	THE MAXIMUM NUMBER OF FRAMES TRANSPORT MAY GENERATE PER MESSAGE INPUT THE MESSAGE WILL BE CANCELED IF EXCEEDED
SYSTEM HIGH SECURITY CLEARANCE	SECRET	THE HIGHEST SECURITY LEVEL MESSAGE THAT CAN BE PROCESSED IN THE NETWORK.

FIG.5

ADDRESS	MASK VALUE HEX (3 OCTETS)	PURPOSE
USER CLASS I NIS MASK	3FFF00	ISOLATES THE NIS PORTION OF THE INTERNET ADDRESS
USER CLASS I CALL SIGN MASK	0000FF	ISOLATES THE CALL SIGN PORTION OF THE INTERNET ADDRESS
INTERNET EQUIP CLASS 1 NIS MASK	3FFF00	ISOLATES THE NIS PORTION OF THE INTERNET ADDRESS
INTERNET EQUIP CLASS 1 CALL SIGN MASK	0000FF	ISOLATES THE CALL SIGN PORTION OF THE INTERNET ADDRESS
INTERNET ADDRESS CLASS FIELD	C00000	ISOLATES THE ADDRESS CLASS FIELD

FIG.6

STATION CLASSMARK PARAMETER	VALUE RANGE	DEFAULT VALUE	PURPOSE
77 NUMBER OF NETS		1	MULTI-NET USER OR INTERNET POINT INDICATES THE NUMBER OF CLASSMARK SETS
NET ID	NIS		HOME NET ID
LOCAL USER-ID(S)	NIS/CS		USER-IDS ASSIGNED TO THIS STATION (UP TO 12)
DCE TYPE	VHF SC VHF FH HF SC HF FH BICC IP BICC EA BICC GATEWAY IP GATEWAY EA GATEWAY HN	VHF FH	SPECIFY THE DCE (RADIO) TYPE. THE DCE TYPE ALSO IMPLIES ADDITIONAL STATION CAPABILITIES & RESPONSIBILITIES. NOTES: SC = SINGLE CHANNEL FH = FREQ HOPPING IP = INTERNET POINT EA = EXTERNAL ACCESS HN = HOME NET
DTE TYPE	UDT HH UDT HQ MIS	UDT HH	SPECIFY THE DTE TYPE CONNECTED. NOTES: HH = HAND HELD HQ = HEADQUARTER

FIG.7

STATION VARIABLE PARAMETER	VALUE RANGE	INITIAL VALUE	PURPOSE
STATION FRAME SEQUENCE NUMBER	0-3F (HEX)	0	IDENTIFIES EVERY FRAME ORIGINATED BY THIS STATION TO DETECT DUPLICATE FRAMES IN THE NETWORK
FRAME PROCESS LOG	50-500 ENTRIES UPPER LIMIT SET BY THE LINK CLASSMARKS	50 (DEFAULT)	HOLDS THE ORIGINATING STATION ADDRESS AND FRAME SEQUENCE OF THE LAST "N" FRAMES RECEIVED

FIG.8

LINK / NET CLASSMARK PARAMETER	VALUE RANGE	DEFAULT VALUE	PURPOSE
NET PRECEDENCE CATEGORY	LOW HIGH	LOW	USED TO QUALIFY THE MESSAGE PRECEDENCE LEVEL, ie ROUTINE vs ROUTINE-LOW
NET CATEGORY	VOICE H VOICE L DATA L DATA H	VOICE H	THIS IS THE PRIORITY OF THE NET. THESE VALUES ESTABLISH MAXIMUM NUMBER OF I FRAMES IN A RADIO TRANSMISSION
DTE TYPE	UDT HH UDT HQ MIS	UDT HH	SPECIFY THE DTE TYPE ASSIGNED TO THE LINK
DCE TYPE	VHF SC VHF FH HF SC HF FH BICC IP BICC EA BICC GATEWAY IP GATEWAY EA GATEWAY HN	VHF FH	SPECIFY THE DCE (RADIO) TYPE ASSIGNED TO THE LINK. THE TYPE ALSO IMPLIES ADDITIONAL STATION CAPABILITIES & RESPONSIBILITIES. NOTES: SC=SINGLE CHANNEL FH=FREQ HOPPING IP=INTERNET POINT EA=EXTERNAL ACCESS HN=HOME NET
RELAY NET	YES / NO	NO	SPECIFIES IF THE RADIO NET IS RELAY OR ALL INFORMED MODE
RELAY UPDATE	YES / NO	NO	IF IN THE RELAY MODE, IS THE ROUTING TABLE UPDATE MESSAGE TO BE SENT OVER THE NET.

FIG.9A

LINK/NET CLASSMARK PARAMETER	VALUE RANGE	DEFAULT VALUE	PURPOSE
FRAME RETRIES	0 TO 3	2	THE MAXIMUM NUMBER OF TIME THE LINK LAYER WILL RETRANSMIT A FRAME. APPLIES TO HDX PROTOCOL ONLY.
RESPONSE MODE	YES/NO	YES	ENABLES THE ACKNOWLEDGEMENT OF I FRAMES. APPLIES TO HDX PROTOCOL ONLY.
DATA INVERT	YES/NO	NO	ENABLES THE COMPLEMENTING OF RECEIVED AND TRANSMITTED DATA TO AND FROM THE PHYSICAL INTERFACE.
HDX TI TIMER	5 TO 120 SECONDS	?	MAXIMUM TIME TP WAIT FOR AN I FRAME ACKNOWLEDGEMENT PRIOR TO RETRANSMISSION OF THE FRAME. HDX PROTOCOL ONLY.
NET CONTROLLERS INTERNET ADDRESS	NIS/CS		THE INTERNET ADDRESS OF THE NET CONTROLLER.
MIS MANAGER'S INTERNET ADDRESS	NIS/CS		THE INTERNET ADDRESS OF THE MIS MANAGER.
RADIO KEYTIME	0 TO 5.6 SECONDS IN 0.1 INCREMENTS	0	RADIO KEYTLME FOR THOSE RADIOS THAT REQUIRE A KEYTIME SEQUENCE PRIOR TO DATA TRANSMISSIONS. ZERO INDICATES NO KEYTIME REQUIRED.
FEC	YES/NO	NO	ENABLE GOLAY 23,12 FORWARD ERROR CORRECTION (FEC)
TDC	YES/NO ONLY VALID IF FEC IS YES	NO	ENABLE TIME DISPERSAL CODING (TDC) 16 BY 24 OF FEC ENCODED DATA.
DATA RATE PHYSICAL INTERFACE	16, 32KBPS X.21 FDX X.21 HDX ASYNCHRONOUS CDP	16 X.21 HDX	DATA TRANSMISSION/RECEPTION RATE IN THOUSAND BITS PER SECOND PHYSICAL INTERFACE TYPE. CDP IS CONDITIONED DIPHAASE.
FCS	16 BIT 32 BIT NONE	32	FRAME CHECK SEQUENCE (FCS) 16 BIT 32 BIT, OR NONE (ASYNCH I/F)
L2 PROTOCOL	FDX HDX (P-T-P)	HDX	SELECTS THE LAYER 2 PROTOCOL. USED FOR ASYNCH & CDP I/F.
THIS NIS	NIS		THIS IS THE NET ID SIGN (NIS) FOR THIS NET.
SIZE OF FRAME PROCESS LOG	50-500	50	THIS DEFINES THE SIZE OF THE FRAME PROCESS LOG MAINTAINED AS A DYNAMIC STRUCTURE.

FIG.9B

FRAME FORMATS WITHOUT AN INFORMATION FIELD - HALF DUPLEX RADIO OPERATION

FLAG	INTRANET ADDRESS FIELD	CONTROL FIELD	FCS FIELD	FLAG
F 01111110 1 OCTET	A 3 OCTETS	C 1 OCTET	FCS 2 OR 4 OCTETS	F 01111110 1 OCTET

FIG.10A

FRAME FORMATS WITH AN INFORMATION FIELD - HALF DUPLEX RADIO OPERATION

FLAG	INTRANET ADDRESS FIELD	CONTROL FIELD	INFORMATION FIELD	FCS FIELD	FLAG
F 01111110 1 OCTET	A 3-18 OCTETS	C 1 OCTET	INFO N-OCTETS	FCS 2 OR 4 OCTETS	F 01111110 1 OCTET

FIG.10B

FRAME FORMATS WITHOUT AN INFORMATION FIELD - HALF DUPLEX P-T-P OPERATION

FLAG	INTRANET ADDRESS FIELD	CONTROL FIELD	FCS FIELD	FLAG
F 01111110 1 OCTET	A 1 OCTET	C 1 OCTET	FCS 2 OR 4 OCTETS	F 01111110 1 OCTET

FIG.10C

FRAME FORMATS WITH AN INFORMATION FIELD - HALF DUPLEX P-T-P OPERATION

FLAG	INTRANET ADDRESS FIELD	CONTROL FIELD	INFORMATION FIELD	FCS FIELD	FLAG
F 01111110 1 OCTET	A 1 OCTET	C 1 OCTET	INFO N-OCTETS	FCS 2 OR 4 OCTETS	F 01111110 1 OCTET

FIG.10D

FRAME FORMAT WITH THE LINK LAYER RELAY ADDRESS FIELD - USED IN RELAY NETS

FLAG	ADDRESS FIELD		CONTROL FIELD	INFORMATION FIELD	FCS FIELD	FLAG
01111110	LINK LAYER RELAY ADDRESS FIELD	INTRANET ADDRESS FIELD				01111110
1 OCTET	N OCTETS	3-18 OCTETS	1 OCTET	N OCTETS	2 OR 4 OCTETS	1 OCTET

FIG.10E

ADDRESS FIELD	
LINK LAYER ADDRESS FIELD N OCTETS	INTRANET ADDRESS FIELD 3-18 OCTETS

FIG.11

INTRANET ADDRESS FIELD		
FRAME TYPE & SEQUENCE NUMBER 1 OCTET	ORIGINATOR'S STATION ADDRESS 1 OCTET	DESTINATION STATION ADDRESSEE LIST (1 TO 16 ADDRESSEES) 1 TO 16 OCTETS

FIG.12

FRAME TYPE	FRAME SEQUENCE NUMBER
2 BIT CODE	6 BIT BINARY NUMBER

FIG.13

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
STATION ADDRESS/NUMBER							LAST ADDRESS

FIG.14

"I" FRAME FORMAT (VARIABLE SIZE)				
FLAG	ADDRESS FIELD	CONTROL FIELD	INFORMATION FIELD	FCS
				FLAG

FIG.15A

ADDRESS FIELD (VARIABLE SIZE)	
HALF DUPLEX (RADIO) PROTOCOL	
LINK LAYER RELAY ADDRESS FIELD (OPTIONAL)	INTRANET ADDRESS FIELD 3 TO 18 OCTETS

FIG.15B

CONTROL FIELD (1 OCTET)	
ACKNOWLEDGEMENT REQUIRED	ACKNOWLEDGEMENT NOT REQUIRED
I4 I3 I2 I1 1 0 0 0 (HEX VALUE)	I4 I3 I2 I1 0 0 0 0 (HEX VALUE)

FIG.16A

WHEN I4 IS SET THIS FRAME IS THE FOURTH I-FRAME IN A TRANSMISSION BLOCK
WHEN I3 IS SET THIS FRAME IS THE THIRD I-FRAME IN A TRANSMISSION BLOCK
WHEN I2 IS SET THIS FRAME IS THE SECOND I-FRAME IN A TRANSMISSION BLOCK
WHEN I1 IS SET THIS FRAME IS THE FIRST I-FRAME IN A TRANSMISSION BLOCK

WHEN I4, I3, I2, & I1 = 0000 THIS FRAME IS IN A SINGLE IFRAME TRANSMISSION BLOCK

INFORMATION FIELD (VARIABLE SIZE) 13 TO 256 OCTETS	
INTERNET HEADER (VARIABLE SIZE) 13 TO 105 OCTETS	TEXT (VARIABLE SIZE) 0 TO 243 OCTETS (MIN HEADER) 0 TO 151 OCTETS (MAX HEADER)

FIG.16B

"S" FRAME FORMAT			
FLAG	ADDRESS FIELD	CONTROL FIELD	FLAG
		FCS	

FIG.17A

ADDRESS FIELD (VARIABLE SIZE)	
HALF DUPLEX PROTOCOL	
LINK LAYER ADDRESS FIELD (OPTIONAL)	INTRANET ADDRESS FIELD 3 OCTETS

FIG.17B

CONTROL FIELD (1 OCTET) HALF DUPLEX PROTOCOL	
RESPONSE FRAME	COMMAND FRAME
I4 I3 I2 I1 1 0 0 0 1 RR	0 0 0 0 0 1 0 1 RNR 0 0 0 0 0 0 0 1 RR

WHEN I4 = 1 ACKING FRAME NO. 4 IN THE BLOCK
WHEN I3 = 1 ACKING FRAME NO. 3 IN THE BLOCK
WHEN I2 = 1 ACKING FRAME NO. 2 IN THE BLOCK
WHEN I1 = 1 ACKING FRAME NO. 1 IN THE BLOCK

FIG.18

"UI" FRAME FORMAT (VARIABLE SIZE)				
FLAG	ADDRESS FIELD	CONTROL FIELD	INFORMATION FIELD	FCS
FLAG				

ADDRESS FIELD (VARIABLE SIZE)	
HALF DUPLEX (RADIO) PROTOCOL	
LINK LAYER RELAY ADDRESS FIELD (OPTIONAL)	INTRANET ADDRESS FIELD 3 TO 18 OCTETS

FIG.19

FRAME FORMATS WITHOUT AN INFORMATION FIELD - BASIC (modulo 8) OPERATION

FLAG	ADDRESS	CONTROL	FCS	FLAG
F 01111110 1 OCTET	A 1 OCTET	C 1 OCTET	FCS 2/4 OCTETS	F 01111110 1 OCTET

FIG.20A

FRAME FORMATS WITH AN INFORMATION FIELD - BASIC (modulo 8) OPERATION

FLAG	ADDRESS	CONTROL	INFORMATION	FCS	FLAG
F 01111110 1 OCTET	A 1 OCTET	C 1 OCTET	INFO N-OCTETS	FCS 2/4 OCTETS	F 01111110 1 OCTET

FIG.20B

CONTROL BITS	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
I FORMAT	N(R)			P	N(S)			0
S FORMAT	N(R)			P/F	S	S	0	1
U FORMAT	M	M	M	P/F	M	M	1	1

N(S) TRANSMITTER SEND NUMBER
 N(R) TRANSMITTER RECEIVE NUMBER
 S SUPERVISORY FUNCTION BIT
 M MODIFIER FUNCTION BIT
 P/F POLL BIT WHEN USED IN A COMMAND,
 FINAL BIT WHEN ISSUED AS A RESPONSE
 P POLL BIT (SET)

THE FOLLOWING TABLE SPECIFIES THE S FRAME FORMAT
 AND THOSE SPECIFIC FORMATS WHICH ARE
 USED BY THE IMPROVED USER DATA PROTOCOL.

CONTROL BITS	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
S FORMAT	N(R)			P/F	S	S	0	1
RR RECEIVE READY	N(R)			P/F	0	0	0	1
RNR RECEIVE NOT READY	N(R)			P/F	0	1	0	1
REJ REJECT	N(R)			P/F	1	0	0	1

FIG.21

FIG.22

FRMR INFORMATION FIELD CODING

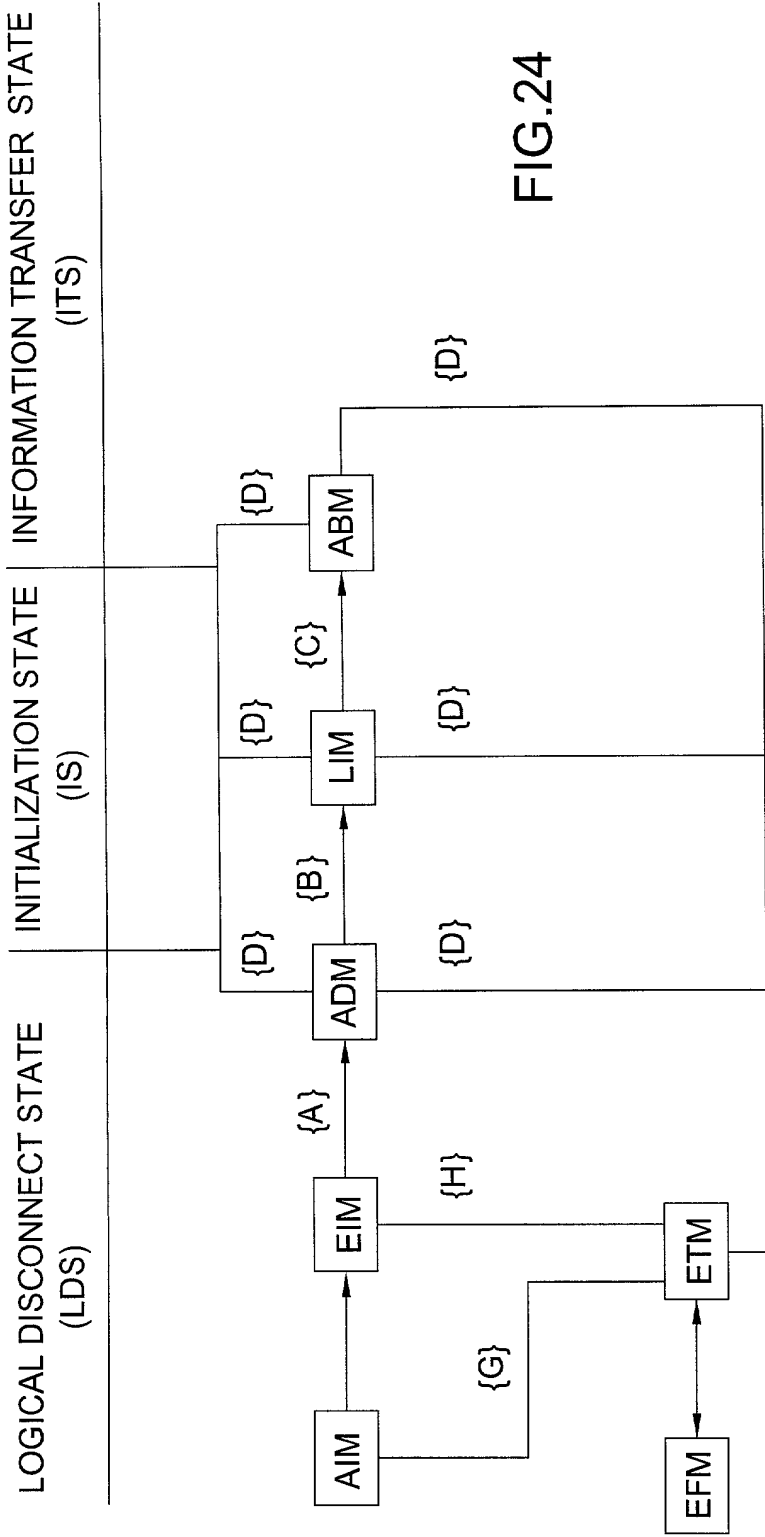
FRMR RESPONSE INFORMATION FIELD 3 OCTETS		
COPY OF THE REJECTED CONTROL FIELD 8 BITS	SENDER'S N (R) & N (S) 8 BITS	REJECT REASONS 8 BITS

SENDER'S N (R) & N (S)				REJECT REASONS				
N (R) 3 BITS	C/R	N (S) 3 BITS	0	0	0	0	0	W

WHERE:

- W=1 IF THE REJECTED CONTROL FIELD IS INVALID OR NOT IMPLEMENTED.
- X=1 IF THE REJECTED CONTROL FIELD WAS DUE TO A NON-PERMITTED INFORMATION FIELD (W IS ALSO SET TO ONE).
- Y=1 IF INFORMATION FIELD EXCEEDS MAXIMUM LENGTH FOR THIS LINK.
- Z=1 IF THE REJECTED CONTROL FIELD CONTAINS AN INVALID N(R) VALUE.
- C/R SET TO 1 IF REJECTED FRAME WAS A RESPONSE FRAME, AND SET TO 0 IF THE REJECTED FRAME WAS A COMMAND FRAME.

FIG.23



LEGEND:

- AIM = AUTOMATIC INITIALIZATION MODE
- EIM = EQUIPMENT INITIALIZATION MODE
- ADM = ASYNCHRONOUS DISCONNECT MODE
- LIM = LINK INITIALIZATION MODE
- ABM = ASYNCHRONOUS BALANCED MODE (BASIC ONLY)
- ETM = EQUIPMENT TEST MODE (SELF TEST)
- EFM = EQUIPMENT FAILURE MODE

EVENTS:

- {A} = LEVEL 2 IN SYNC (FLAGS)
- {B} = SIM, UA
- {C} = SABM, UA
- {D} = PROTOCOL FAILURE (TIMEOUT/NO ACK)
- {G} = LOCAL TESTS PASS
- {H} = HARDWARE FAILURE

RECEIVED FRAME	STATION STATE					
	ADM OF LDS		LIM OF IS		ABM OF ITS	
	SEND	FINAL STATE	SEND	FINAL STATE	SEND	FINAL STATE
SIM	UA	LIM	UA	LIM	DM	ADM
DISC	UA	ETM	UA	ETM	UA	ETM
UI	DM	ADM	UA	LIM	UA	ABM
SABM	DM	ADM	UA	ABM	UA	ABM
I FRAME	DM	ADM	NONE	LIM	N (R)	ABM

FIG.25

BIT/ BYTE	7	6	5	4	3	2	1	0
00	EOM	FRAME SEQUENCE NUMBER						
01	ORIGINATORS INTERNET ADDRESS							
02								
03								
04								
05	MSN #1				MSN #2			
06	MSN #3				MSN #4			
07	PRECEDENCE				SECURITY			
08	MESSAGE TYPE/PROTOCOL							
09	MAXIMUM HOP COUNT							
10	DESTINATION ADDRESSEE STATUS BYTE							
	DEL	EXTEND	U	EOR	X	A1	A2	A3
11	DESTINATION ADDRESSEE BASIC INTERNET ADDRESS							
12								
13								
14								
15	DESTINATION ADDRESSEE STATUS BYTE							
	DEL	EXTEND	U	EOR	X	A1	A2	A3
16	DESTINATION ADDRESSEE EXTENDED INTERNET ADDRESS							
17								
18								

FIG.26

INTERNET HEADER ELEMENTS

INFORMATION ELEMENT	BIT REPRESENTATION	CHARACTER REPRESENTATION
EOM STATUS	MSB = 1, LAST FRAME	
FRAME SEQUENCE NUMBER 01-127	7 BINARY BIT VALUE	3 NUMERIC CHARACTERS 001-127
ORIGINATOR'S INTERNET ADDRESS (USER-ID)	3 BYTES XX = NIS ID Z = CALL SIGN	TRANSLATED TO A SYMBOLIC OR USE THE XX/Z FORMAT
MESSAGE SERIAL NUMBER 0000-9999	4 BCD (4 BIT DIGITS)	4 NUMERIC CHARACTERS 0000-9999
MESSAGE PRECEDENCE NETCON FLASH (HIGH) FLASH (LOW) PRIORITY (HIGH) PRIORITY (LOW) ROUTINE (HIGH) ROUTINE (LOW)	4 BIT CODE 0000 0001 0010 0011 0100 0101 0110	1 ALPHA CHARACTER N F F P P R R
MESSAGE SECURITY TOPSECRET SECRET CONFIDENTIAL RESTRICTED UNCLASS	4 BIT CODE 1000 0100 0011 0010 0001	1 ALPHA CHARACTER T S C R U
MESSAGE TYPE OR PROTOCOL	8 BIT CODE	SEE THE MESSAGE TYPE/PROTOCOL TABLE
MAXIMUM HOP COUNT	8 BIT BINARY	MAXIMUM NUMBER OF INTERNET HOPS TRANSMISSION
DESTINATION STATUS	8 BIT CODE	SEE STATUS TABLE
DESTINATION INTERNET ADDRESS (USER-ID) XXZ YYXXZ	3 BYTES OR 5 BYTES XX = NIS ID Z = CALL SIGN YY = ATTACHED NIS XXZ = ORIG USER-ID	TRANSLATED TO A SYMBOLIC OR XX/Z YY:XX/Z

FIG.27

MESSAGE TYPE/PROTOCOL TABLE

MESSAGE TYPE PROTOCOL	VALUE	DESCRIPTION
INTERNET CONTROL	00-20	RANGE OF INTERNET CONTROL MESSAGE PROTOCOL MESSAGE TYPES
SYSCON MESSAGES	21-40	RANGE OF SYSTEM CONTROL MESSAGES
USER DEFINED MESSAGE FORMATS	41-60	RANGE OF USER DEFINED MESSAGE FORMATS. THE FOLLOWING VALUES HAVE BEEN ASSIGNED; 41, & 42. THESE VALUES ARE ASSIGNED TO THE USERS END-TO-END ACKNOWLEDGEMENT AND MESSAGE NON DELIVERY NOTIFICATION.
ENCAPSULATED PROTOCOLS	61-80	RANGE OF PROTOCOL WHICH CAN BE ENCAPSULATED BY THE BOWMAN USER DATA PROTOCOL. THESE PROTOCOLS USE THE BUDP FOR BACKBONE SERVICES TO CONNECT THEIR "OWN NETWORK" NODES OR TO EXTEND THE RANGE OF THEIR "HOST SYSTEMS."

FIG.28

SYSCON MESSAGE TYPES

SYSCON MESSAGE	MESSAGE TYPE VALUE	DESCRIPTION
SYSCON DIRECTIVES	21	THIS MESSAGE CONTAINS A SYSCON DIRECTIVE. THE TEXT HEADER SPECIFIES THE DIRECTIVE TYPE AND THE TEXT CONTAINS THE DIRECTIVE TEXT.
STSCON ALARM & NOTIFICATIONS	22	THIS MESSAGE CONTAINS AN ALARM OR NOTIFICATION. THE TEXT HEADER SPECIFIES THE TYPE.
SYSCON REPORTS	23	THIS MESSAGE CONTAINS A SYSCON REPORT. THE TEXT HEADER SPECIFIES THE REPORT TYPE.
SYSCON ACKNOWLEDGEMENT	24	THIS MESSAGE CONTAINS A SYSCON ACKNOWLEDGEMENT. THE TEXT HEADER SPECIFIES THE ACKNOWLEDGEMENT TYPE.

FIG.29

ICMP MESSAGE TYPES

ICMP MESSAGE	MESSAGE TYPE VALUE	DESCRIPTION
TRANSPORT ACKNOWLEDGEMENT	01	TRANSMITTED BY THE DESTINATION TRANSPORT TO THE ORIGINATING TRANSPORT SPECIFYING THE FRAMES RECEIVED FOR THE SPECIFIED DESTINATION ADDRESSEE(s)
LINK CONGESTION CONTROL NOTIFICATION (LCCN)	02	SENT TO RESTRICT/RESUME THE SPECIFIED PRECEDENCE INTERNET TRAFFIC
NET CONGESTION CONTROL NOTIFICATION	03	SENT TO RESTRICT/RESUME THE SPECIFIED PRECEDENCE NET TRAFFIC
INTERNET NODE QUERY MESSAGE	04	MESSAGE SENT/RECEIVED BETWEEN INTERNET NODES TO DETERMINE/MAINTAIN COMMUNICATION CAPABILITIES
INTERNET STATUS REPORT	05	REPORT SENT TO THE NET CONTROLLER CONTAINING INTERNET NODE STATUS AND TRAFFIC METERS
INTERNET NODE FAILURE/RECOVERY NOTIFICATION	06	SENT TO INTERNET NODES REPORTING EITHER A FAILURE OR RECOVERY OF ANOTHER INTERNET NODE
USER REGISTRATION MESSAGES	07	SENT BETWEEN NET CONTROLLERS AND GATEWAYS WHEN A USER REGISTERS IN A NET. THIS MESSAGE CAUSES THE NET MEMBERS LIST IN THE AFFECTED NETS TO BE MODIFIED.

FIG.30

USER DEFINED MESSAGE TYPES

USER DEFINED MESSAGE	MESSAGE TYPE VALUE	DESCRIPTION
USER ACKNOWLEDGEMENT	41	THE ACKNOWLEDGEMENT SENT TO THE ORIGINATOR OF A MESSAGE INDICATING THE ACKNOWLEDGEMENT TYPE IN THE TEXT HEADER
MESSAGE NON DELIVERY NOTIFICATION	42	MESSAGE SENT TO THE ORIGINATOR WHICH SPECIFIES THE ADDRESSES WHICH WERE NOT DELIVERED, WITH A REASON CODE.

FIG.31

USER ACKNOWLEDGEMENT TEXT HEADER

TEXT HEADER ELEMENT	VALUE/RANGE	DESCRIPTION
ACKNOWLEDGEMENT TYPE	RECEIVED READ PRINTED	ACK FOR MSG RECEIVED ACK FOR MSG READ ACK FOR MSG PRINTED

FIG.32

BASIC INTERNET ADDRESS		
CLASS CODE	USER-ID	
	NIS	CS

EXTENDED INTERNET ADDRESS		
CLASS CODE	NIS	BASIC INTERNET ADDRESS

FIG.34

STATUS BYTE TABLE

STATUS/BYTE NAME	BIT POSITION	MEANING
DEL	7	WHEN SET, INDICATES THAT THIS ADDRESSEE HAS BEEN DELIVERED
EXTEND	6	WHEN SET, INDICATES THAT THIS ADDRESSEE IS AN EXTENDED ADDRESS (5 BYTES) WHEN RESET, INDICATES THAT THIS ADDRESSEE IS A BASIC ADDRESS (3 BYTES)
U	5	USER DEFINED
EOR	4	END OF ROUTING BIT WHEN SET, INDICATES THAT THIS IS THE LAST ADDRESSEE IN THE INTERNET HEADER
X	3	NOT ASSIGNED
A1	2	USER ACKNOWLEDGEMENT 1 REQUIRED WHEN SET. ACKNOWLEDGE ON MESSAGE RECEIPT
A2	1	USER ACKNOWLEDGEMENT 2 REQUIRED WHEN SET. ACKNOWLEDGE WHEN MESSAGE IS READ
A3	0	USER ACKNOWLEDGEMENT 3 REQUIRED WHEN SET. ACKNOWLEDGE WHEN MESSAGE IS PRINTED

FIG.35

BASIC ADDRESS ENTRY

	7	6	5	4	3	2	1	0
BYTE 0	STATUS							
BYTE 1	X							
BYTE 2	X							
BYTE 3	Z							

FIG.36

EXTENDED ADDRESS ENTRY

	7	6	5	4	3	2	1	0
BYTE 0	STATUS							
BYTE 1	Y							
BYTE 2	Y							
BYTE 3	X							
BYTE 4	X							
BYTE 5	Z							

FIG.37

INTERNET ADDRESS 3 OCTETS		
CLASS CODES	NIS	CALL SIGN

FIG.38

ICMP MESSAGE TYPES

ICMP MESSAGE	MESSAGE TYPE VALUE	DESCRIPTION
TRANSPORT ACKNOWLEDGEMENT	01	TRANSMITTED BY THE DESTINATION TRANSPORT TO THE ORIGINATING TRANSPORT SPECIFYING THE FRAMES RECEIVED FOR THE SPECIFIED DESTINATION ADDRESSEE(S)
LINK CONGESTION CONTROL NOTIFICATION(LCCN)	02	SENT TO RESTRICT / RESUME THE SPECIFIED PRECEDENCE INTERNET TRAFFIC
NET CONGESTION CONTROL NOTIFICATION	03	SENT TO RESTRICT / RESUME THE SPECIFIED PRECEDENCE NET TRAFFIC
INTERNET NODE QUERY MESSAGE	04	MESSAGE SENT/RECEIVED BETWEEN INTERNET NODES TO DETERMINE / MAINTAIN COMMUNICATION CAPABILITIES
INTERNET STATUS REPORT	05	REPORT SENT TO THE NET CONTROLLER CONTAINING INTERNET NODE STATUS AND TRAFFIC METERS
INTERNET NODE FAILURE/RECOVERY NOTIFICATION	06	SENT TO INTERNET NODES REPORTING EITHER A FAILURE OR RECOVERY OF ANOTHER INTERNET NODE
USER REGISTRATION MESSAGES	07	SENT BETWEEN NET CONTROLLERS AND GATEWAYS WHEN A USER REGISTERS IN A NET. THIS MESSAGE CAUSES THE NET MEMBERS LIST IN THE AFFECTED NETS TO BE MODIFIED

FIG.39

TRANSPORT ACKNOWLEDGEMENT MESSAGE

MESSAGE ELEMENT	VALUE/RANGE	DESCRIPTION
NUMBER OF INTERNET ADDRESSES ACKNOWLEDGING	1 TO 16	EACH DESTINATION TRANSPORT CONTROL CAN ACKNOWLEDGE FOR UP TO 16 DESTINATION ADDRESSEES
ACKNOWLEDGEMENT STATUS	ACK LAST ACK ABORT	THIS FIELD SPECIFIES THE TYPE OF ACKNOWLEDGEMENT. ACK INDICATES THAT THE DESTINATION WILL ACCEPT RE-TRANSMITTED FRAMES, LAST ACK INDICATES A COMPLETE MESSAGE HAS BEEN RECEIVED, & ABORT SPECIFIES THE FRAMES THAT WERE RECEIVED BUT THE DESTINATION WILL NOT ACCEPT ANY MORE FRAMES FOR THIS MESSAGE.
FRAME NUMBER BIT MAP	16 OCTET BIT MAP FOR 127 BITS	THIS BIT MAP REPRESENTS EACH FRAME OF A MULTI-FRAME MESSAGE. THE FRAME NUMBER RANGES FROM 1 TO 127. THE BIT MAP USES ONE BIT PER FRAME NUMBER (127 BITS) IN A 16 OCTET FIELD. THE MSB REPRESENTS FRAME 1 AND THE LSB REPRESENTS FRAME 127.
DESTINATION ADDRESS 1	BASIC INTERNET ADDRESS	THIS FIELD INDICATED THE FIRST DESTINATION ADDRESS THAT IS ACKNOWLEDGING THE FRAMES AS SPECIFIED ABOVE.
DESTINATION ADDRESS "N"	BASIC INTERNET ADDRESS	THIS FIELD INDICATED THE "N"th DESTINATION ADDRESS THAT IS ACKNOWLEDGING THE FRAMES AS SPECIFIED ABOVE.

FIG.40

LCCN MESSAGE

MESSAGE ELEMENT	VALUE / RANGE	DESCRIPTION
RESTRICTING ROUTINE PRECEDENCE TRAFFIC	TRUE / FALSE	TRUE INDICATES THAT THIS PRECEDENCE IS BEING RESTRICTED
RESTRICTING PRIORITY PRECEDENCE TRAFFIC	TRUE / FALSE	TRUE INDICATES THAT THIS PRECEDENCE IS BEING RESTRICTED
RESTRICTING FLASH PRECEDENCE TRAFFIC	TRUE / FALSE	TRUE INDICATES THAT THIS PRECEDENCE IS BEING RESTRICTED

FIG.41

TABLE ICMP STATUS REPORT TEXT HEADER

FIELD	VALUE / RANGE	DESCRIPTION
REPORT ID	INTERNET STATUS ROUTE REPORT	IDENTIFIES THE SPECIFIC REPORT

FIG.43

TABLE REPORT TEXT

FIELD	VALUE / RANGE	DESCRIPTION
REPORT TEXT	VARIABLE	ACTUAL REPORT TEXT

FIG.44

TABLE INTERNET STATUS REPORT FORMAT

FIELD	VALUE / RANGE	DESCRIPTION
NET IDENTIFIER	0 - 64K	THIS IS THE NET IDENTIFIER FOR THE INTERNET INTERFACE BEING REPORTED.
NUMBER OF FRAMES TRANSMITTED	0 - 64K	THE NUMBER OF INTERNET FRAMES TRANSMITTED INTO THE NET
NUMBER OF FRAMES RECEIVED	0 - 64K	THE NUMBER OF INTERNET FRAMES RECEIVED FROM THE NET.
AVERAGE NUMBER OF FLASH FRAMES IN QUEUE	0 - 64K	THE AVERAGE NUMBER OF FLASH FRAMES WAIT TO BE TRANSMITTED. SAMPLES TAKEN EVERY "N" SECOND, TOTAL DIVIDED BY THE NUMBER OF SAMPLES.
AVERAGE NUMBER OF PRIORITY FRAMES IN QUEUE	0 - 64K	THE AVERAGE NUMBER OF PRIORITY FRAMES WAIT TO BE TRANSMITTED. SAMPLES TAKEN EVERY "N" SECOND, TOTAL DIVIDED BY THE NUMBER OF SAMPLES.
AVERAGE NUMBER OF ROUTINE FRAMES IN QUEUE	0 - 64K	THE AVERAGE NUMBER OF ROUTINE FRAMES WAIT TO BE TRANSMITTED. SAMPLES TAKEN EVERY "N" SECOND, TOTAL DIVIDED BY THE NUMBER OF SAMPLES.
PEAK NUMBER OF FLASH FRAMES IN QUEUE	0 - 64K	THE HIGHEST NUMBER OF FRAMES IN QUEUE PER SAMPLE PERIOD.
PEAK NUMBER OF PRIORITY FRAMES IN QUEUE	0 - 64K	THE HIGHEST NUMBER OF FRAMES IN QUEUE PER SAMPLE PERIOD.
PEAK NUMBER OF ROUTINE FRAMES IN QUEUE	0 - 64K	THE HIGHEST NUMBER OF FRAMES IN QUEUE PER SAMPLE PERIOD.
NET OCCUPANCY	0 - 100%	THE PERCENTAGE OF TIME THE NET IS BUSY IN A REPORT PERIOD.
NEXT NET IDENTIFIER	NIS NULL	THE NEXT NET IDENTIFIER FOR THE INTERNET INTERFACE BEING REPORTED OR NULL FOR END OF REPORT
SAME DATA AS ABOVE FOR THE NEXT NIS		

FIG.45

TABLE INTERNET ROUTE REPORT TEXT

FIELD	VALUE / RANGE	DESCRIPTION
NIS (ROUTE)	NIS NULL	THIS IS THE NIS (ROUTE) BEING REPORTED. NULL INDICATES THE END OF THE REPORT.
USAGE FLAG	YES / NO	INDICATES IF THE ROUTE HAS BEEN USED.
FRAME COUNT	0 - 64K	THE NUMBER OF FRAME THAT USED THIS ROUTE SINCE THE LAST REPORT.

FIG.46

FIELD	VALUE / RANGE	DESCRIPTION
REGISTRATION MESSAGE ID	REGISTRATION DE-REGISTRATION CHANGE REGISTRATION	THIS IS THE ACTUAL DIRECTIVE IDENTIFICATION
DATA BASE SELECTED	i.e. NET "A"'s DATA BASE	SPECIFIES THE DATA BASE THAT THIS REGISTRATION IS TO BE APPLIED (NET MEMBERS LIST)
USER'S USER-ID	USER-ID (NIS / CS)	THE USER-ID OF THE USER REGISTERING
NEW NIS	NULL NIS	EITHER NULL OR THE NEW OUT-OF-NET NIS WHERE THE USER IS NOW REGISTERED

FIG.47

SYSCON MESSAGE	MESSAGE TYPE VALUE	DESCRIPTION
SYSCON DIRECTIVES	21	THIS MESSAGE CONTAINS A SYSCON DIRECTIVE. THE TEXT HEADER SPECIFIES THE DIRECTIVE TYPE, AND THE TEXT CONTAINS THE DIRECTIVE TEXT.
SYSCON ALARMS & NOTIFICATIONS	22	THIS MESSAGE CONTAINS AN ALARM OR NOTIFICATION. THE TEXT HEADER SPECIFIES THE ALARM OR NOTIFICATION TYPE.
SYSCON REPORTS	23	THIS MESSAGE CONTAINS A SYSCON REPORT. THE TEXT HEADER SPECIFIES THE REPORT TYPE. THE TEXT AREA CONTAINS THE ACTUAL REPORT TEXT.
SYSCON ACKNOWLEDGEMENTS	24	THIS MESSAGE CONTAINS A SYSCON ACKNOWLEDGEMENT. THE TEXT HEADER SPECIFIES THE ACKNOWLEDGEMENT CLASS (POS OR NEG) IN ADDITION TO THE ACKNOWLEDGEMENT TYPE (DIRECTIVE RECEIPT / IMPLEMENTED, ETC.)

FIG.48

SYSCON DIRECTIVE TEXT HEADER

FIELD	VALUE / RANGE	DESCRIPTION
DIRECTIVE ID	i.e. UPDATE NET MEMBERS LIST	THIS IS THE ACTUAL DIRECTIVE IDENTIFICATION
NUMBER OF OPERATIONS IN THIS MESSAGE	1 TO N	THIS FIEL SPECIFIES THE NUMBER OF OPERATIONS FOR THE DIRECTIVE ID IN THIS SYSCON MESSAGE. THE DIRECTIVES ARE IN THE DIRECTIVE TEXT FIELD.
DATA BASE SELECTED	i.e. NET "A" 's DATA BASE	SPECIFIES THE DATA BASE THAT THIS DIRECTIVE IS TO BE APPLIED

FIG.49

DIRECTIVE TEXT		
FIELD	VALUE / RANGE	DESCRIPTION
DIRECTIVE OPERATION	ADD / CHANGE DELETE PURGE / RESET	ADD OR CHANGE A RECORD DELETE A RECORD DELETE ALL RECORDS
DIRECTIVE ARGUMENTS	VARIABLE	RECORD KEY, FOLLOWED BY THE ADD / CHG DATA IF APPLICABLE
NEXT DIRECTIVE OPERATION	ADD / CHANGE DELETE PURGE / RESET	ADD OR CHANGE A RECORD DELETE A RECORD DELETE ALL RECORDS
NEXT DIRECTIVE ARGUMENTS	VARIABLE	RECORD KEY, FOLLOWED BY THE ADD / CHG DATA IF APPLICABLE

FIG. 50

SYSCON ALARMS & NOTIFICATION TEXT HEADER

FIELD	VALUE / RANGE	DESCRIPTION
ALARM OR NOTIFICATION ID	i.e. 'INTERNET OVERLOAD'	IDENTIFIES THE SPECIFIC ALARM OR NOTIFICATION

FIG. 51

ALARM & NOTIFICATION TEXT

FIELD	VALUE / RANGE	DESCRIPTION
ALARM / NOTIFICATION TEXT	VARIABLE	ACTUAL ALARM OR NOTIFICATION TEXT

FIG. 52

SYSCON REPORT TEXT HEADER

FIELD	VALUE / RANGE	DESCRIPTION
REPORT ID	i.e. "INTERNET LINK USAGE REPORT"	IDENTIFIES THE SPECIFIC REPORT

FIG.53

REPORT TEXT

FIELD	VALUE / RANGE	DESCRIPTION
REPORT TEXT	VARIABLE	ACTUAL REPORT TEXT

FIG.54

SYSCON ACKNOWLEDGEMENT TEXT HEADER

FIELD	VALUE / RANGE	DESCRIPTION
ACKNOWLEDGEMENT ID	RECEIVED IMPLEMENTED NOT IMPLEMENTED	IDENTIFIES THE SPECIFIC ACKNOWLEDGEMENT TYPE

FIG.55

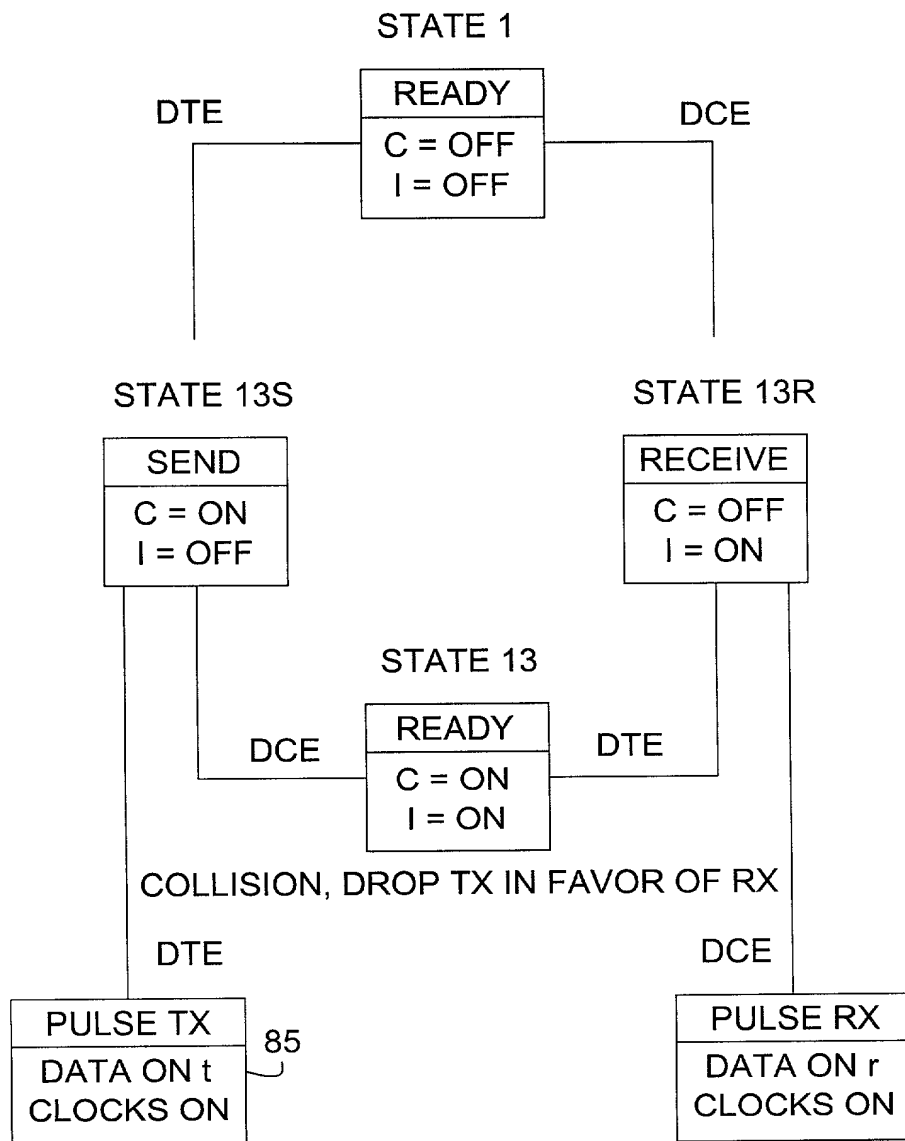
ACKNOWLEDGEMENT TEXT

FIELD	VALUE / RANGE	DESCRIPTION
DIAGNOSTIC CODE	VARIABLE	REASON WHY DIRECTIVE WAS NOT IMPLEMENTED

FIG.56

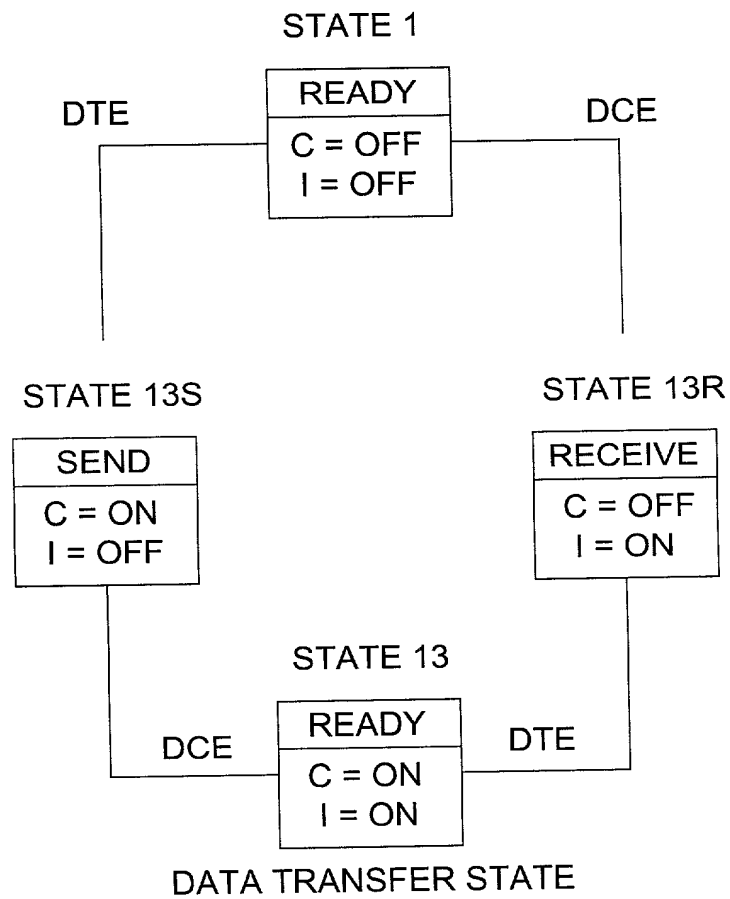
INTERNET HEADER FOR LAYERS FOUR AND BELOW	FRAME NUMBER & EOM FLAG			INTERNET HEADER FOR THE PRESENTATION LAYER
	ORIGINATOR ADDRESS			
	MESSAGE SEQUENCE NUMBER			
	PRECEDENCE			
	SECURITY			
	HOP COUNT			
	DESTINATION ADDRESSES			
	GPS POSITION	USER POSITION DATA		
	TIME			

FIG.57



NOTE: C = CONTROL INTERCHANGE CIRCUIT
 I = INDICATION INTERCHANGE CIRCUIT
 t = TRANSMIT DATA CIRCUIT
 r = RECEIVE DATA CIRCUIT
 OFF = BINARY 1 ON = BINARY 0
 CLOCKS ON = CLOCKS PRESENT FROM THE DCE

FIG.58



NOTE: C = CONTROL INTERCHANGE CIRCUIT
I = INDICATION INTERCHANGE CIRCUIT

OFF = BINARY 1 ON = BINARY 0

FIG.59

ASYNCHRONOUS TRANSMISSION									
ASYNCHRONOUS PREAMBLE 8 OCTETS					LINK LAYER FRAME (XXXX OCTETS)			ASYNCH CHECKSUM 2 OCTETS	
SYN	SYN	SI	X	X	X	ADDR FIELD	CONTROL FIELD	INFO FIELD	

FIG.60

IUDP FRAME's INFORMATION FIELD		
IUDP INTERNET HEADER MESSAGE TYPE / PROTOCOL=61	X.25 PACKET	
	X.25 GENERAL FORMAT IDENTIFIER & PACKET HEADER	X.25 TEXT

FIG.61

IUDP FRAME's INFORMATION FIELD			
MIL-STD-1777 IP PACKET			
IUDP INTERNET HEADER MESSAGE TYPE / PROTOCOL=62	MIL-STD-1777 IP HEADER "PROTOCOL" FIELD INDICATES THE NEXT PROTOCOL HEADER	NEXT PROTOCOL AS SPECIFIED BY THE 1777 IP HEADER	AS SPECIFIED BY THE SECONDARY HEADER

THE MIL-STD-1777 IP "PROTOCOL" FIELD CAN SPECIFY THE NEXT LAYERS TO BE:

- MIL-STD-1778 TRANSMISSION CONTROL PROTOCOL (TCP)
- MIL-STD-1777 INTERNET CONTROL MESSAGE PROTOCOL (ICMP)
- MIL-STD-XXXX. USER DATAGRAM PROTOCOL

NOTE: THIS IS NOT AN ALL INCLUSIVE LIST OF PROTOCOLS TRANSFERRED BY THE MIL-STD-1777 IP.

FIG.62

IUDP FRAME's INFORMATION FIELD			
MIL-STD-1778 INFORMATION PACKET			
IUDP INTERNET HEADER MESSAGE TYPE / PROTOCOL=63	MIL-STD-1778 TCP HEADER "PROTOCOL" FIELD INDICATES THE NEXT PROTOCOL HEADER	NEXT PROTOCOL AS SPECIFIED BY THE 1778 TCP HEADER	AS SPECIFIED BY THE SECONDARY HEADER

THE MIL-STD-1778 TCP HEADER SPECIFIES THE NEXT LAYER PROTOCOL.
TWO OF THESE PROTOCOLS ARE LISTED BELOW.
IT SHOULD BE NOTED THAT IN THIS EXAMPLE THE IUDP IS USED
AS THE DATA GRAM SERVICE (NETWORK LAYER) INSTEAD OF
THE MIL-STD-1777 INTERNET PROTOCOL.

- MIL-STD-1780 FILE TRANSFER PROTOCOL
- MIL-STD-1781 SIMPLE MAIL TRANSFER PROTOCOL

FIG.63